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DISCUSSION PAPER SERIES

IZA DP No. 10479

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Brady P. Horn
University of New Mexico

Johanna Catherine Maclean
Temple University and IZA

Michael R. Strain
American Enterprise Institute for Public Policy Research

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IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Do Minimum Wage Increases Influence Worker Health?*

This study investigates whether minimum wage increases in the United States affect an important non-market outcome: worker health. To study this question, we use data on lesser-skilled workers from the 1993-2014 Behavioral Risk Factor Surveillance Surveys coupled with differences-in-differences and triple-difference models. We find little evidence that minimum wage increases lead to improvements in overall worker health. In fact, we find some evidence that minimum wage increases may decrease some aspects of health, especially among unemployed male workers. We also find evidence that increases reduce mental strain among employed workers.

JEL Classification: I1, I11, I18

Keywords: minimum wage, self-reported health, differences-in-differences

Corresponding author:
Johanna Catherine Maclean
Department of Economics
Temple University
1301 Cecil B. Moore Ave
Philadelphia, PA 19122
USA
E-mail: catherine.maclean@temple.edu

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1. Introduction

Over the last several decades, economists have devoted considerable effort to studying the effects of minimum wage increases on the level of employment. More recently, economists have examined the effects of minimum wage increases on other social and economic outcomes. In this study, we contribute to this growing literature by examining the impact of minimum wage increases on workers' self-reported health. To the best of our knowledge, this paper is the first to study this important issue using data on the United States labor market.

Standard economic models of the demand for health — e.g., Grossman (1972) — suggest a link between minimum wage increases and health, as minimum wage increases theoretically affect both income levels and time costs. However, economic theory does not provide an unambiguous prediction of the relationship between minimum wage increases and worker health, as income and time cost effects may offset each other. Any impact of minimum wages on health is likely heterogeneous due to differential effects across the population of affected individuals — for example, workers who remain employed following a minimum wage hike experience income gains, all else equal, whereas workers whose employment opportunities are diminished will likely experience income losses. Ultimately, a rigorous empirical analysis is required to determine the direction and magnitude of the impact of minimum wage increases on health. Our objective is to provide such estimates.

Estimating the relationship between minimum wage increases and worker health is a timely endeavor and provides new information for an important public policy question: How do minimum wage increases impact workers holistically, across dimensions including but not limited to employment? Understanding the full impact of minimum wage increases on workers is important for determining how well predictions from standard economic models can inform us about real world outcomes. It is also important to better understand the broad range of minimum wage effects, so that economics can more accurately inform public policy.

The federal government and state governments have long used minimum wage increases with the goal of improving the welfare of lesser-skilled workers. This is increasingly true of local governments as well. For example, some political leaders are currently calling for a $15 per hour minimum wage in their jurisdictions, and several local jurisdictions have already approved $15 per hour minimum wages.[1] In addition, there is support among some federal elected leaders for increasing the federal minimum wage to $12 per hour.

Relative to the current federal minimum wage of $7.25 per hour, $15 represents a 107% increase and $12 represents a 66% increase. Considerations of the welfare effects of policy changes of this magnitude should include, but not be limited to, employment effects. Specifically, if minimum wage increases improve overall outcomes for lesser-skilled workers, then it is possible that the increase will still prove to be, on balance, welfare improving for lesser-skilled workers — even if employment losses occur. However, if instead such increases lead to unintended consequences such as diminished health outcomes in addition to employment losses, then policymakers may wish to consider using a different set of policy tools to improve outcomes for lesser-skilled workers.

To study this question, we use data on a sample of lesser-skilled workers (those without any college education) from the 1993 to 2014 Behavioral Risk Factor Surveillance Survey. Over this time period all states implemented at least one change to their minimum wage, and the federal minimum wage was increased six times. These policy changes generate substantial

[1] http://www.nytimes.com/2015/10/11/opinion/sunday/the-minimum-wage-how-much-is-too-much.html?_r=0. Accessed November 9th, 2015.

variation in minimum wages. We use difference-in-differences and triple-difference models to estimate the effect of minimum wage increases on lesser-skilled worker health.

The remainder of this paper is organized as follows: Section 2 reviews related literature and our conceptual framework. Section 3 outlines our data, variables, and methods. Results are reported in Section 4, and Section 5 presents extensions to the main analysis and robustness checks. Finally, Section 6 concludes.

2. Related Literature and Conceptual Framework

In this section, we first briefly review the literature on the labor-market effects of minimum wage increases[2], and we review the small number of studies of the effect of minimum wage increases on health-related outcomes. Additionally, we use the Grossman model (1972) to provide a conceptual framework for thinking through the ways in which minimum wage increases might affect worker health.

2.1 Related Literature

Although numerous studies over several decades have examined the impacts of minimum wages on employment, the literature has not yet reached consensus. In a seminal paper, Card and Krueger (1994) study New Jersey's 1992 minimum wage increase by comparing employment in that state with employment in neighboring Pennsylvania. They do not find disemployment effects associated with the minimum wage increase. Dube, Lester, and Reich (2010) advance this approach by studying all counties in the U.S. that share a border with a county in a neighboring state. Their research design exploits the fact that neighboring counties in different states are subject to different minimum wage laws while (potentially) experiencing

[2] For comprehensive reviews, we refer readers to Card and Krueger (1994), and Neumark and Wascher (2008).

the same (unobservable) local labor market shocks. They too find no evidence of minimum wage disemployment effects.

Neumark, Salas, and Wascher (2014) argue that the heavily saturated models estimated by Dube, Lester, and Reich (2010) control for the very disemployment effects that are being investigated. In their preferred specifications, Neumark, Salas, and Wascher (2014) find evidence that minimum wage increases do decrease employment. These results are in keeping with a series of papers summarized in Neumark and Wascher (2008) that discuss the 'old consensus range' for the employment elasticity of minimum wage increases of -0.1 to -0.3. However, a number of papers find no statistically significant effects of minimum wage increases and others find disemployment elasticities outside the old consensus range. Sabia, Burkhauser, and Hansen (2012) find a minimum wage employment elasticity of -0.7, for example.

Other recent research has focused on other labor market outcomes and different econometric approaches. For example, Meer and West (2015) find that minimum wage increases reduce employment growth (rather than the level of employment). Gittings and Schmutte (2014) also focus on labor dynamics, and find that minimum wage increases reduce worker flows and increase job stability. Clemens and Wither (2014) study the employment and income trajectories of lesser-skilled workers, and attempt to more precisely identify minimum wage workers. They find significant disemployment effects, along with diminished employment and income trajectories. Additionally, minimum wage increases have not been shown to significantly affect poverty rates (Burkhauser and Sabia 2007; Sabia and Burkhauser 2010).

A smaller set of economics studies have examined minimum wage increases on non-market outcomes, particularly health-related outcomes. The existent studies provide quite mixed findings. Two studies explore the possibility that minimum wage increases impact body weight

(Meltzer and Chen 2011; Cotti and Tefft 2013) and generate opposing findings. While Meltzer and Chen (2011) show that minimum wage increases raise body weight, Cotti and Tefft (2013) find little evidence that minimum wage increases are associated with body weight. Similarly, in terms of risky behavior, although Adams, Blackburn, and Cotti (2012) provide strong evidence that an increase in the minimum wage raises alcohol-related traffic fatalities among teens, in a recent paper Sabia, Pitts, and Argys (2014) call to question the strength of this relationship. In a recent study, Wehby, Dave, and Kaestner (2016), using birth record data, document that minimum wage increases lead to improved birth outcomes, potentially through increases in the use of prenatal care and decreases in prenatal smoking.

The two studies most similar to our work are Lenhart (2015) and Reeves et al. (2016). These two studies apply a differences-in-differences design to study the effect of a 1999 increase in the minimum wage on the health of workers in the United Kingdom. Collectively, the studies find that wage increases lead to improvement in self-reported health, the same measure we examine here, and mental health. However, the differences between the U.S. and U.K. labor markets and healthcare systems suggest that this relationship may be different in the U.K. than in the U.S. In addition, Lenhart (2015) and Reeves et al. (2016) exploit a single increase in the national minimum wage which occurred over 15 years ago, while we consider over 300 minimum wage changes at both the state and federal level over a 22-year period.

2.1 Conceptual Framework

Within economics, the Grossman model (1972) is a standard starting point for analysis of the demand for many health outcomes (Cawley and Ruhm 2012).[3] In the Grossman model individuals are assumed to receive a health endowment at birth, Ω. Consumers value health, h,

[3] As noted by Cawley and Ruhm, recent empirical work using the Grossman model often relies on the intuition offered by the model rather than strict reliance on the model's theoretical attributes. We follow this tradition here.

and other goods, X. They make consumption choices to maximize utility subject to preferences, prices, income, and the health production function. Health is modeled as a stock variable that depreciates over time at rate δ. Individuals can restore health, to some extent, by making investments (I) in their health. Investments include market goods, M, such as healthcare or healthy foods, and non-market goods, NM, such as exercise and rest.

Equation (1) provides a simplified version of the Grossman model[4]:

(1) $h(\Omega)_t = \delta h(\Omega)_{t-1} + I_{t-1}(M_{t-1}, NM_{t-1})$

This version of the Grossman model captures the model features of direct relevance to our study; in particular, the complicated impact of minimum wages on health. Minimum wage increases will not affect a worker's health endowment,[5] and are unlikely to impact a worker's health depreciation rate.[6] But such increases may impact a worker's investments in market and non-market goods through changes in (1) income levels and (2) time costs.

2.2.1 Income Changes

Labor market earnings are an important component of total income among American households. Using the 2013 American Community Survey, 84% of total personal income for individuals ages 21 to 54 years are derived from wages and salary. Changes in income impact a consumer's ability to purchase market inputs to the health production function.

Minimum wage increases likely affect different workers differently. Workers who retain their jobs following the increase earn higher wages and therefore have higher incomes, all else

[4] For simplicity, we assume no discounting on the part of consumers.
[5] As noted earlier, the health endowment is determined at birth and therefore predates minimum wage changes.
[6] It is possible that minimum wages, through income and time cost changes, could also lead to changes in the depreciation rate. For example, if extra income from a minimum wage increase is allocated to illicit drug use, this behavior may lead to an increase in the depreciation rate. But this effect would take a long time to materialize, as the depreciation rate is a slow-moving parameter that is determined by a wide set of factors, many of which, like the health endowment, are exogenous to health behaviors.

equal, while workers whose employment outcomes diminish may see their incomes reduced. In the Grossman model, workers with higher incomes following a minimum wage increase should experience improvements in their health as they can invest more in market goods, while workers earning less should experience health declines (all else equal).

However, several factors may mute minimum wage income-induced health improvements. First, although the Grossman model yields a clear prediction that income improves health, the empirical literature has produced ambiguous findings (Kim and Ruhm 2012; Ettner 1996; Meer, Miller, and Rosen 2003; Apouey and Clark 2015; Au and Johnston 2014; Frijters, Haisken-DeNew, and Shields 2005; Schmeiser 2009; Evans, Wolfe, and Adler 2012). For example, in recent work Apouey and Clark (2015) show that exogenous gains in income have no impact on overall self-reported health, but such income gains do improve self-reported mental health. Moreover, several studies suggest that unhealthy goods (alcohol, tobacco, illicit drugs, fattening foods, and so forth) may also be normal goods, the consumption of which will rise with income gains, potentially reducing health outcomes (Apouey and Clark 2015; Ettner 1996; Kenkel, Schmeiser, and Urban 2014; Petry 2000).

Applying these findings to our paper, minimum-wage induced increases in income may not be allocated to health-enhancing investments. Instead, extra income may be allocated to goods that can reduce health. Thus, the empirical literature implies that the income-health relationship is potentially more complicated than predicted by the traditional Grossman model.

In addition, many minimum wage workers are secondary earners and have family incomes well above the federal poverty line (Shannon 2013). Therefore, the income impacts of minimum wage increases may have limited income-induced effects on health, positive or negative, as many minimum wage earners contribute only a small share to overall family resources. Higher minimum wages may lead to lower hours of work if firms attempt to reduce labor costs induced by the minimum wage increase by reducing labor demand on the intensive margin, muting income gains for workers who do retain their jobs following minimum wage increases. Further, minimum wage increases may affect participation in safety net programs, which might affect health and overall household income, however the evidence is mixed on this mechanism (Page, Spetz, and Millar 2005; Reich and West 2015).

2.2.2 Time Costs

Individuals whose employment outcomes are diminished following minimum wage increases will experience a reduction in the time costs of investing in their health: Less time working allows for more time to invest in non-market goods (Ruhm 2000). Of course, reductions in time costs will only lead to health improvement if individuals use the additional time to invest in health improving non-market goods. If, instead, individuals use additional time to engage in unhealthy activities such as drinking, illicit drug use, overeating, or sedentary activities, then health may be unchanged or perhaps decline. For workers who keep their jobs and see their incomes increase, the opportunity cost of an hour of time has increased, thereby making investments in non-market goods more expensive.

A series of studies exploits changes in economic conditions (e.g., state unemployment rates) to study how changes in employment impact health-related time use. Such findings may also capture the effects of income losses on such behaviors, and thus findings cannot be fully attributable to changes in time costs. For example, Colman and Dave (2013) find mixed results. On one hand, job losers increase leisure time physical activity. However, these increases in leisure time physical activity do not offset reductions in on the job physical activity, thus the overall physical activity actually declines. In addition, job loss increases both sedentary activity (television watching), which may harm health, and rest, which may improve health. Additional research in this area provides similarly mixed findings (Ruhm 2005; Xu and Kaestner 2010; Charles and DeCicca 2008; Arkes 2012; Arkes 2007). Collectively, these studies suggest that, although reduced time costs offer individuals the opportunity to improve health through non-market, time-intensive good investments, the extent to which workers engage in such investments is not clear.

In summary, potential income and time mechanisms through which minimum wage increases impact health may operate in conjunction, or in opposition, to one other. Our objective is to assess empirically the net impacts of these (potentially offsetting) mechanisms.

3. Data, Variables, and Empirical Models

3.1 Data: Behavioral Risk Factor Surveillance Survey (BRFSS)

To examine the impact of minimum wage increases on self-reported health, we use repeated cross sections of lesser-skilled adults from the BRFSS. The BRFSS is a large, nationally representative telephone survey conducted annually, beginning in 1984, by the Centers of Disease Control and Prevention (CDC). The survey collects information on a wide range of health-related outcomes and a limited set of employment outcomes. The BRFSS is commonly used within the economics literature to study health-related outcomes (Courtemanche 2009; Sabia, Pitts, and Argys 2014; Adams, Cotti, and Tefft 2015; Courtemanche 2011; Helliwell and Huang 2014). We utilize surveys fielded between 1993 and 2014, as those years include (nearly) all states[7] and our outcome variables of interest (described in the next section).

The 1993 to 2014 BRFSS cross-sections include 6,439,746 respondents ages 18 to 99 years. We make several exclusions to construct our analysis sample. First, we exclude

[7] All states completed the BRFSS from 1996 onward. The District of Columbia is missing in 1995, Rhode Island is missing in 1994, and Wyoming is missing in 1993.

individuals not residing in the 50 states or the District of Columbia since we cannot match these individuals to state minimum wages. Second, we exclude those individuals who are less than 21 years of age and older than 54 years; we make these exclusions in order to focus our study on prime age workers.[8] Third, we exclude individuals who are self-employed, not in the labor force (e.g., retired), or in long-term unemployment.[9] Fourth, we exclude individuals with more than a high school education to focus on workers who are most likely to be affected by minimum wage legislation. Lastly, we exclude individuals with missing information on variables used in the analysis (described later in the paper). These exclusions leave us with an analysis sample of 347,421 men and 377,520 women.

3.2 Outcome Variables

We first construct an indicator for current employment, which we use to estimate a minimum wage-employment model. We next examine four self-reported health measures. BRFSS respondents are asked, 'In general, how would you rate your health?' The possible response categories are: excellent, very good, good, fair, and poor. We recode this variable to construct indicator variables for (1) excellent or very good health and (2) fair or poor health. We consider two additional self-reported health measures: (1) 'Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?' and (2) 'Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?' These two questions direct respondents to consider specific aspects of health (physical and mental).

[8] We chose to focus on prime age workers because we seek to understand how minimum wage increases impact the health of workers who are likely to be persistently affected by low wages for the duration of their careers.

[9] Including these respondents in our analysis sample does not appreciably change our findings, however. More details are available on request from the corresponding author.

These questions are subjective. Researchers have investigated which dimensions of objective health these survey questions capture. The literature generally suggests that these measures capture an overall assessment of health, which may represent some combination of mental and physical health (Apouey and Clark 2015). Moreover, the measures have been shown to predict health outcomes such as mortality and healthcare utilization (Benjamins et al. 2004; Miilunpalo et al. 1997; Jylhä 2009). Therefore, we conclude that the self-reported health measures in our data plausibly correlate with objective health. The economics literature generally agrees, and these self-reported measures have been used in numerous economics studies (Maclean 2013; Apouey and Clark 2015; Maclean et al. 2015; Lenhart 2015; Bockerman and Ilmakunnas 2009; Gravelle and Sutton 2009; Lindeboom and van Doorslaer 2004; Cottini and Lucifora 2013). However, previous research suggests that such measures do contain reporting error (Baker, Stabile, and Deri 2004), which may affect our estimates.

Our self-reported measures are particularly useful for a study, such as ours, of the short-run health effects of minimum wages. It seems unlikely that more severe or objective measures of poor health (e.g., mortality, chronic conditions, hospitalizations) will respond in the short-run to a change in minimum wages (and the associated income and time cost changes). Thus, our analysis of self-reported health, which captures how a person evaluates their health at a point in time, is potentially more responsive, and therefore more suitable, for our study objectives than more severe or objective measures.

3.3 Minimum Wages

We use information on statutory federal and state minimum wages collected by the University of Kentucky Center for Poverty Research (2015). The effective minimum wage is defined as the higher of the state and federal minimum wage in each state. We convert the nominal minimum effective wage to 2014 dollars using the Consumer Price Index – Urban Consumers. We use a one year lag in the minimum wage to allow for the minimum wage to affect health outcomes. The Grossman model includes a time delay between minimum wage increases and health: investments occur in period *t-1* and health is observed in period *t*. In unreported analyses, we re-estimated our models using the current (unlagged) the current minimum wage and a two year lag in the minimum wage, results are not appreciably different.

3.4 Control Variables

We include several state anti-poverty policies that may correlate with both minimum wage increases and our measures of self-reported health among lesser-skilled workers. Specifically, we include the maximum Temporary Assistance for Needy Families (TANF)[10] benefit for a family of four, the maximum Supplementary Nutrition Assistance Program (SNAP) benefit for a family of four, and the state Earned Income Tax Credit (EITC) as a percentage of the federal EITC. These data are drawn from the University of Kentucky Poverty Research Center Database (2015).

To capture broader economic conditions in the state that may be correlated with both minimum wage increases and our outcome variables, we include the seasonally adjusted state unemployment rate from the Bureau of Labor Statistics Local Area Unemployment Database, per capita personal income from the Bureau of Economic Analysis, and the average hourly wage among workers age 16 to 64 years from the Outgoing Rotation Groups in the Current Population Survey. We convert all nominal values to 2014 dollars using the Consumer Price Index – Urban Consumers. We control for a set of individual characteristics that may predict self-reported

[10] This program was formally called Aid to Families and Dependent Children.

health: race (African American and other race, with white race as the omitted category), and education (a high school diploma with less than high school as the omitted group).

3.5 Empirical Models

We estimate the impact of minimum wage increases on worker self-reported health with the following regression model:

(2) $$Y_{istm} = \alpha_0 + \alpha_1 MW_{st-1} + \alpha_2' P_{st} + \alpha_3' X_{istm} + \theta_s + \tau_t + \Omega_{st} + M_m + \varepsilon_{istm}$$

Y_{istm} is a self-reported health measure for individual *i* in state *s* in year *t* surveyed in month *m*. MW_{st-1} is the lagged minimum wage in state *s* in year *t*. P_{st} is a vector of state policies and characteristics that may influence the health of lesser-skilled workers, and X_{istm} is a vector of individual characteristics. θ_s and τ_t are vectors of state and year fixed effects. State fixed effects capture time invariant state-level characteristics that influence lesser-skill worker health (e.g., under-lying health levels within the state population) while year fixed effects capture changes in well-being that emerge over time at the national level (e.g., national policies that may influence well-being and overall macroeconomic conditions). We also include state-specific linear time trends (Ω_{st}) to address time-varying state-level factors for which we lack data (e.g., social preferences toward improving well-being among lesser-skilled workers not captured by the included policies). M_m is a vector of month fixed effects which account for seasonality in health outcomes (Christodoulou et al. 2012). Finally, ε_{ist} is a random error term.

In our differences-in-differences (DD) models, the treatment group is composed of states that increase their minimum wages, while the control group is composed of states that do not. A concern with this research design is that outcome variables in states that do and do not increase minimum wages may follow different trends, which would violate the statistical assumption necessary for the DD estimator to recover causal effects. To address this concern, we include a range of control variables in our estimating equations, including fixed effects and state-specific linear trends, described above. In addition, in an extension to the main analysis, we estimate triple difference (DDD) models, which 'difference out' pre- and post-treatment outcomes from the DD results using a placebo group unaffected by the treatment. Specifically, we use an additional within-state comparison group as our placebo group: retired adults age 70 years and older with no more than a high school education. This group is likely unaffected by minimum wage increases, but is likely impacted by other social policies and broader economic and social factors that may affect health outcomes within a state.

As we do not expect minimum wage increases to impact health outcomes in this placebo sample, it follows that if we find evidence of a relationship between minimum wage increases and health in the placebo sample, then there are likely residual omitted variables in the DD models that bias our DD results. Alternatively, if we find no relationship between minimum wage increases and health in the placebo sample, then we can recover the DDD estimator by calculating the difference between the DD estimates from our analysis sample and our placebo sample. Taking this third difference allows us to remove residual, unobserved, state-varying factors from our DD estimates.

We use linear probability models for binary outcomes and OLS for continuous outcomes.[11] We cluster the standard errors at the state level (Bertrand, Duflo, and Mullainathan 2004). We apply weights provided by the CDC to generate nationally representative estimates. However, unweighted results are not appreciably different from those reported here. All models are estimated separately for men and women due to well established differences in labor market participation rates by sex (Blau and Kahn 2007).

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[11] Results are not qualitatively different if we instead estimate models in which the outcome is binary (a count) using a probit model (negative binomial model). Results were not appreciably different than those reported here.

4. Results

4.1 Variation in Minimum Wages

In our analysis sample there were 313 minimum wage changes due to state legislation and 6 increases in the federal minimum wage. The majority of the state changes were increases, although there was also a small minority of decreases (four). Each state changed its minimum wage at least once during our analysis period, and the number of changes ranges from a minimum of one (Kansas) to a maximum of fourteen (Vermont and Washington). All federal changes during this period were increases. Table 1 reports each minimum wage change, the state and year in which it occurred, along with federal increases.

4.2 Summary Statistics

Table 2 reports summary statistics for our analysis sample. 92% of men and 91% of women are employed (our analysis sample includes only workforce participants, thus employment rates are higher than would be expected in the general population). Among men, 50% report their health as very good or excellent while 14% report their health as fair or poor. The average number of days in the last 30 on which men report their physical and mental health was not good is 2.1 and 2.9. Turning to women, 50% report their health as very good or excellent, 14% report their health as fair or poor, and the average number of days in the last 30 on which physical and mental health are reported as not good is 2.8 and 4.4.

4.3 Effects of Minimum Wage Increases on the Probability of Employment

We first estimate DD employment regressions to establish whether minimum wage increases are associated with disemployment effects in our sample. Selected results are reported in Table 3, the left-hand panel contains results for men and the right-hand panel reports results for women. We find evidence that minimum wage increases lead to reductions in the probability of employment. Specifically, a 1 dollar increase in the minimum wage leads to a 0.4 percentage point (0.4%) decrease in the probability of employment among men and a 0.7 percentage point (0.8%) decrease among women. These coefficients imply employment elasticities of -0.03 and -0.06 among men and women.[12] The magnitude of these effects is broadly consistent with disemployment effects found in the minimum wage literature.

4.4 Effects of Minimum Wage Increases on Health

The top panel of Table 4 reports selected results from our DD regression models of minimum wage increases and self-reported health outcomes for male workforce participants. Among men, we find evidence that minimum wage increases increase the probability of reporting one's health as fair or poor: a 1 dollar increase in the lagged minimum wage increases the probability that a man reports his health as fair or poor by 0.7 percentage points. Relative to the baseline proportion in our sample (0.139) this coefficient estimate implies a 5.0% increase. However, minimum wage increases are not linked with any other health outcomes examined here among men. In these models, we find no evidence that minimum wage increases improve the health of male workers. In fact, we find evidence that minimum wage increases actually hurt the self-reported health of male workers.

The bottom panel of Table 4 reports a comparable set of results for female workforce participants. The DD estimates generated in the female sample provide no evidence that minimum wage increases impact health among women. The coefficients are statistically indistinguishable from zero in all four regressions. As with men, we find no evidence that minimum wage increases improve the health of female workers.

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[12] We calculate elasticities using the following formula: $\varepsilon = \frac{\%\Delta outcome}{\%\Delta Minimum\_wage}$. We compare the change in each outcome (employment or health) to the sample mean to determine the numerator. We compare the change in minimum wage ($1) to the sample mean ($7.2 for men and $7.1 for women) to calculate the denominator.

4.5 Triple Difference Models

Our DD models use states that do not change their minimum wage as a comparison group. However, it is reasonable to be concerned that these models do not fully address bias from policies or from other factors that occur concurrently with minimum wage changes. To address these potential sources of bias, we use a within state comparison group in a triple difference model (DDD): We select elderly adults ages 70 years and above who have retired from the labor market as our 'placebo sample.'

Table 5 reports results from the DDD models. We report coefficient estimates from the analysis sample and placebo sample for completeness. As expected, we find no evidence that minimum wage increases impact health outcomes in the placebo sample, providing some additional validation for our DD model. Turning to the DDD estimates, we find they are broadly similar in magnitude to the DD estimates, again suggesting that our DD model successfully controlled for many potentially confounding factors. Having said that, none of our DDD estimates are statistically significant, suggesting that minimum wage increases have no effect on health, positive or negative. However, the triple difference models use less variation in minimum wage increases, which limits their ability to precisely estimate treatment effects. The DDD estimates provide additional evidence that minimum wage increases do not improve the health of lesser skill U.S. workers.

4.6 Heterogeneity in the Effects of Minimum Wage Increases on Health by Employment Status

Minimum wage increases are likely to help some workers and hurt other workers. To dig deeper, an important dimension to consider is employment status: employed or unemployed. As discussed earlier in the paper, the income and time costs effects attributable to minimum wage increases likely differ across these two groups. To explore the possible heterogeneity in health effects between employed and unemployed workers, we stratify the sample by employment status and report separate estimates.[13]

Results generated in our DD and DDD models are reported in Table 6. Results for men are reported in the top panel and results for women are reported in the bottom panel. We find that minimum wage increases lead to increases in the probability of reporting one's health as fair or poor and decreases in the number of days reporting bad mental health for employed men. Specifically, a 1 dollar increase in the lagged minimum wage leads to a 0.8 percentage point (6.0%) increase in the probability of reporting one's health as fair or poor and an increase in the lagged minimum wage leads to a 0.12 day (4.3%) reduction in the number of bad mental health days in the past 30 days.

These results are different than those from the full sample of male workers. As with all male workers, employed male workers see an increase in self-reported fair or poor health, but unlike all male workers they see a decrease in days in bad mental health. We interpret these findings conservatively, and take them as evidence that minimum wage increases do not substantially improve the overall health of employed workers, but may reduce mental strain. Findings generated in the DDD model are comparable in magnitude, although the coefficient estimate in the fair or poor health regression is not statistically different from zero.

Our results for unemployed men are different. Among unemployed men we find in our DD models that minimum wage increases lead to increases in the number of days in bad physical health: a 1 dollar increase in the lagged minimum wage leads to an additional 0.74 days in bad physical health in the past 30 days. This increase is larger than the effect magnitudes we

[13] When interpreting these results, it is important to keep in mind that if minimum wage increases reduce the probability of employment (we find evidence that it does in our sample), then we are potentially stratifying our sample on an endogenous variable. This stratification could lead to bias in our estimates.

estimate for employed men: relative to the baseline mean (3.7 days), which translates to a 20.0% increase in bad physical health days. In addition, we find no evidence of any offsetting positive health effects associated with minimum wage increases among unemployed men. Findings generated in the DDD model are comparable.

Among employed women the DD models reveal no statistically significant relationship between minimum wage increases and the measures of self-reported health we study here. Surprisingly, among unemployed women we find that a 1 dollar increase in the lagged minimum wage leads to a 2.9 percentage point (7.7%) increase in the probability of reporting one's health as very good or excellent.

The DDD models suggest that a 1 dollar increase in the lagged unemployment rate leads to a reduction of 0.17 days (4.1%) in bad mental health in the past 30 days among employed women, as with employed male workers. Comparable to the DD models, we find a 3.2 percentage point (8.4%) increase in the probability of reporting one's health as very good or excellent among unemployed women. No other coefficient estimates are statistically distinguishable from zero.

5. Extensions and Robustness Checking

We next consider extensions to our main models and the robustness of our core findings to several robustness checks.

5.1 Analysis of Potential Mechanisms

We have so far considered the net impact of minimum wage increases on health outcomes and we have argued that the observed changes are likely attributable to changes in income and time costs. We now attempt to shed some light on potential mechanisms. To this end, we use information on health behaviors contained in the BRFSS. Specifically, we construct indicators for any smoking, binge drinking in the past 30 days (defined as five or more drinks consumed in one drinking session), heavy drinking in the past 30 days (defined as one or more drinks per day for women and two or more drinks per day for men), and any non-work exercise in the past 30 days.[14] We also examine the daily number of fruits and vegetables consumed.[15]

These variables can proxy for investments that can harm health or improve health. While all variables are arguably produced with both market and non-market goods, we might expect that smoking, alcohol use, and diet variables are disproportionately affected by income changes (as these goods must be purchased in the market), while exercise is more likely to be determined by time cost changes (although there are of course monetary costs to engaging in physical activity, the time costs of this activity likely dominate). We estimate our DD models on the full sample, employed sample, and unemployed sample.

Results from our exploratory analysis of mechanisms are reported in Appendix Table A. Our findings from this analysis are decidedly mixed. Among men, we find no evidence that minimum wage increases impact smoking or alcohol use. Additionally, we find no impact of minimum wage increases on physical activity. However, we find that among the full sample of men and employed men minimum wage increases reduce the number of fruits and vegetable servings consumed each day. This finding is counter to our expectation, as fruits and vegetables are likely normal goods.

We find that minimum wage increases reduce the probability of smoking and binge drinking among all women. These effects appear to be broadly comparable across employment status, although the magnitude and statistical significance of the findings varies to some extent.

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[14] Our definitions of heavy and binge drinking are based on CDC drinking guidelines.
[15] Due to changes in the BRFSS survey design, these questions are not available in all years and states. More details on the variables are available from the corresponding author.

Additionally, we find some evidence that employed women are more likely to report physical activity following a minimum wage increase, suggesting that this activity is a normal good.

In summary, our analysis of mechanisms does not provide direct insight on the net relationships we estimate between minimum wage increases and health outcomes**.** However, our analysis is in line with the mixed results in the broader economic literature that examines the effects of income on health, and the relationship between economic conditions and health behaviors. Moreover, it is possible that our (relatively) crude measures do not capture the dimensions of health investment that are impacted by minimum wage increases.

5.2 Alternative Controls for Between State Differences

Our core models control for unobservable (to the economist) between-state differences in part by including state fixed effects and state-specific linear time trends. These controls are powerful and commonly used, but they impose specific forms on unobservable differences. For robustness, we estimate our models using three alternative approaches to address such differences: (1) using state fixed effects and not state-specific linear time trends, (2) replacing state-specific linear time trends with state-specific quadratic time trends, and (3) including a full set of fixed effects for each region[16]/year pair.

Results are reported in Appendix Table B. They are broadly consistent with our main findings, and suggest that, on balance, minimum wage increases do not increase worker health, and may decrease health outcomes.

6. Conclusions

In this study, we offer new evidence on the effects of minimum wage increases on lesser-skilled workers. Much of the minimum wage literature has focused on standard labor market

[16] We use the four regions of the U.S.: Northeast, South, Midwest, and West.

outcomes, and relatively few studies have assessed non-employment outcomes (Adams, Blackburn, and Cotti 2012; Cotti and Tefft 2013; Sabia, Pitts, and Argys 2014; Lenhart 2015; Meltzer and Chen 2011; Wehby, Dave, and Kaestner 2016; Reeves et al. 2016). To the best of our knowledge, this paper is the first to investigate the impact of minimum wage increases on the self-reported health of workers in the U.S.

Several findings emerge from our analysis. First, we find evidence of disemployment effects associated with minimum wage increases for both male and female workers. Second, we find that following a minimum wage increase, men are more likely to report their health as poor. Third, we find that employed men are more likely to report their health as fair or poor, but also see a reduction in the number of days they experience mental strain. These findings for employed men make it difficult to draw any firm conclusions about the relationship between minimum wage increases and health among this group of workers, but certainly they suggest that minimum wage increases do not unambiguously improve health. Fourth, we find that unemployed male workers experience worse physical health following minimum wage increases and no commensurate improvement in mental health — unemployed men experience the largest health losses following minimum wage increases. Fifth, we do not find evidence that the health of female workers is affected by minimum wage increases. Finally, when we estimate the relationship between minimum wage increases and health using a triple-difference model, we find broadly similar results as with our DD model.

In sum, we find, on balance, little evidence which suggests that minimum wage increases leave workers in substantially better health, and we find some evidence that minimum wage increases negatively impact the physical health of unemployed male workers.

When interpreting our findings, it is important to consider whether the effects we identify are economically significant. Over our sample period, the average minimum wage was roughly $7. Thus, by estimating the effect of a $1 change in the (lagged) minimum wage on self-reported health, we are examining a relatively large increase in the minimum wage: roughly a 14% increase. In our main DD regressions models we find that a 1 dollar increase in the lagged minimum wage leads to a 5% increase in the probability of reporting one's health as fair or poor among men. This suggests a health-minimum wage elasticity of -0.36 — larger than the 'old consensus range' of employment-minimum wage elasticities and substantially larger than the employment-elasticities estimated in our sample (-0.03 for men and -0.06 for women).

Our findings are immediately policy relevant, as governments at all levels in the United States are considering increasing statutory minimum wages. Over the course of his presidency, President Obama first called for the federal minimum wage to increase from $7.25 per hour to $9 per hour, then for it to increase to $10.10 per hour, and currently supports a $12 per hour federal minimum. The governor of New York has proposed a $15 per hour minimum wage for his state, and several localities have increased their minimum wages to $15 per hour as well.

The public debate over these policies focuses on disemployment effects. Economists are unsure of the level of the minimum wage which will generate significant employment reductions. But the minimum wage impacts more than the level of employment, and policymakers are likely interested in general welfare of lesser-skill workers in a more holistic sense. Our study should inform the policy debate about the broader welfare effects of minimum wage increases.

Table 1. State and Federal minimum wage changes, 1992-2013

State	Year of change
AK	1997, 1998, 2002, 2009, 2010
AL	1997, 1998, 2007, 2008, 2009
AR	1996, 1997, 2007
AZ	1997, 1998, 2007, 2008, 2009, 2011, 2012, 2013
CA	1996, 1997, 1998, 2000, 2002, 2007, 2008
CO	1996, 1997, 2007, 2008, 2009, 2010, 2011, 2012, 2013
CT	1996, 1997, 1999, 2000, 2001, 2002, 2003, 2004, 2006, 2007, 2009, 2010
DC	1994, 1997, 1998, 2005, 2008, 2009, 2012
DE	1996, 1997, 1999, 2000, 2007, 2008, 2009
FL	1996, 1997, 2006, 2007, 2008, 2009, 2010, 2012, 2013
GA	2001, 2009, 2010
HI	1992, 1993, 2002, 2003, 2006, 2007
IA	1992, 1996, 1997, 2007, 2008
ID	1997, 1999, 2000, 2002, 2007, 2008, 2009
IL	1996, 1997, 2004, 2005, 2007, 2008, 2009, 2011
IN	1998, 1999, 2007, 2008, 2009
KS	2010
KY	1996, 1997, 2000, 2001, 2007, 2008
LA	1996, 1997, 2007, 2008, 2009
MA	1992, 1996, 1997, 2000, 2001, 2007, 2008
MD	1996, 1997, 2007, 2008, 2009
ME	1997, 1998, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009
MI	1996, 1997, 2006, 2007, 2008
MN	1997, 2005
MO	1996, 1997, 2007, 2008, 2009, 2010, 2013
MS	1996, 1997, 2007, 2008, 2009
MT	1996, 1997, 2007, 2008, 2009, 2010, 2011, 2012, 2013
NC	1992, 1993, 1997, 2007, 2008, 2009
ND	1996, 1997, 2007, 2008, 2009
NE	1997, 2007, 2008, 2009
NH	1996, 1997, 2007, 2008, 2009
NJ	1992, 1999, 2005, 2006, 2009
NM	1993, 2003, 2008, 2009
NV	1996, 1997, 2006, 2008, 2009, 2011
NY	2000, 2005, 2006, 2007, 2009
OH	2006, 2007, 2008, 2009, 2011, 2012, 2013
OK	1997, 2007, 2008, 2009
OR	1992, 1997, 1998, 1999, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2011, 2012, 2013
PA	1997, 1998, 2007, 2008, 2009
RI	1996, 1997, 1999, 2001, 2004, 2006, 2007, 2013
SC	1997, 1998, 2007, 2008, 2009
SD	1997, 2007, 2008, 2009
TN	1997, 1998, 2007, 2008, 2009
TX	2001, 2007, 2008, 2009
UT	1996, 1997, 2007, 2008, 2009
VA	1992, 1996, 1997, 2007, 2008, 2009
VT	1995, 1996, 1997, 1999, 2001, 2004, 2005, 2006, 2007, 2008, 2009, 2011, 2012, 2013
WA	1994, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2007, 2008, 2009, 2011, 2012, 2013
WI	1992, 1996, 1997, 2005, 2007, 2009
WV	1997, 2006, 2007, 2008
WY	2001
Federal	1996, 1997, 1998, 2007, 2008, 2009

Source: University of Kentucky Poverty Research Center Database (2015).

Table 2. Summary statistics, BRFSS 1993-2014

Variables	**Men**	**Women**
Employment and health outcomes		
Employed (1/0)	0.923	0.913
Very good or excellent health (1/0)	0.496	0.499
Fair or poor health (1/0)	0.139	0.143
Days poor physical health, past 30 days	2.134	2.827
Days poor mental health, past 30 days	2.923	4.431
State characteristics		
Minimum wage, lagged	7.191	7.149
Max TANF benefit, family of four (dollars)	626.3	622.1
Max SNAP benefit, family of four (dollars)	618.6	616.2
State EITC as a percentage of the federal EITC	0.0514	0.0534
Per capita personal income	33,648	32,943
Unemployment rate	6.065	5.942
Average hourly wage	15.97	15.91
Personal characteristics		
Age	36.37	37.92
White	0.709	0.715
Non-white	0.291	0.285
Hispanic	0.244	0.186
Less than high school education	0.257	0.205
High school education	0.743	0.795
Observations	347,421	377,520

Notes: BRFSS sample weights applied. Sample includes all observations that provide a valid response to at least one of the employment and health outcomes. Observations with missing state and demographics are excluded from the analysis sample. All monetary values converted to 2014 dollars using the CPI – Urban Consumers.

Table 3. Effect of minimum wage increases on employment: BRFSS 1993 to 2014

Sample:	**Men**	**Women**
Sample proportion	0.923	0.913
Lagged minimum wage	-0.004**	-0.007***
	(0.002)	(0.002)
Observations	347,421	377,520

Notes: All models estimated with a LPM and control for state characteristics, individual characteristics, month fixed effects, state fixed effects, year fixed effects, and state-specific linear time trends. All monetary values converted to 2014 dollars using the CPI – Urban Consumers. BRFSS sample weights applied. Standard errors are clustered around the state and reported in parentheses.

***; **;*=statistically different from zero at the 1%; 5%; and 10% level.

Table 4. Effect of minimum wage increases on health: BRFSS 1993 to 2014

Outcome:	**Very good/excellent**	**Fair/ poor**	**Bad physical health days**	**Bad mental health days**
Sample: Men				
Sample proportion/mean	0.496	0.139	2.134	2.923
Lagged minimum wage	-0.001	0.007***	0.028	-0.061
	(0.004)	(0.002)	(0.038)	(0.050)
Observations	346,536	346,536	333,888	333,380
Sample: Women				
Sample proportion/mean	0.499	0.143	2.827	4.431
Lagged minimum wage	0.002	0.002	0.045	-0.091
	(0.006)	(0.002)	(0.062)	(0.069)
Observations	376,690	376,690	361,495	361,106

Notes: All models estimated with a LPM (binary outcome) or OLS (continuous outcome) and control for state characteristics, individual characteristics, month fixed effects, state fixed effects, year fixed effects, and state-specific linear time trends. All monetary values converted to 2014 dollars using the CPI – Urban Consumers. BRFSS sample weights applied. Standard errors are clustered around the state and reported in parentheses. ***;**;*=statistically different from zero at the 1%; 5%; and 10% level.

Table 5. Effect of minimum wage increases on health using triple difference estimators: BRFSS 1993 to 2014

Outcome:	Very good/excellent	Fair/ poor	Bad physical health days	Bad mental health days
Sample: Men				
Sample proportion/mean	0.496	0.139	2.134	2.923
Lagged minimum wage	-0.001	0.007***	0.028	-0.061
	(0.004)	(0.002)	(0.038)	(0.050)
Observations	346,536	346,536	333,888	333,380
Sample: Women				
Sample proportion/mean	0.499	0.143	2.827	4.431
Lagged minimum wage	0.002	0.002	0.045	-0.091
	(0.006)	(0.002)	(0.062)	(0.069)
Observations	376,690	376,690	361,495	361,106
Sample: Retired adults, placebo sample				
Sample proportion/mean	0.292	0.357	6.161	2.180
Lagged minimum wage	-0.003	0.002	-0.013	0.070
	(0.003)	(0.003)	(0.093)	(0.052)
Observations	478,933	478,933	447,912	456,953
DDD estimates for men[a]	0.002	0.005	0.042	-0.132
	(0.006)	(0.006)	(0.122)	(0.090)
DDD estimates for women[a]	0.005	-0.0001	0.058	-0.161
	(0.007)	(0.006)	(0.121)	(0.104)

Notes: All models estimated with a LPM (binary outcome) or OLS (continuous outcome) and control for state characteristics, individual characteristics, month fixed effects, state fixed effects, year fixed effects, and state-specific linear time trends. All monetary values converted to 2014 dollars using the CPI – Urban Consumers. BRFSS sample weights applied. Standard errors are clustered around the state and reported in parentheses. ***;**;*=statistically different from zero at the 1%; 5%; and 10% level.

[a] DDD estimates are calculated by taking the difference between the DD estimate and male placebo sample DD estimate. 95% confidence intervals for the DDD estimate are calculated using a parametric bootstrap (500 repetitions) and reported in square brackets.

Table 6. Effect of minimum wage increases on health by employment status: BRFSS 1993 to 2014

Outcome:	Very good/excellent	Fair/ poor	Bad physical health days	Bad mental health days
Sample: Men				
Sample proportion/mean	0.504	0.133	2.006	2.720
Employed men	-0.001	0.008***	-0.046	-0.118**
	(0.004)	(0.002)	(0.039)	(0.047)
Observations	321,442	321,442	309,737	309,260
DDD estimates[a]	0.002	0.006	-0.032	-0.189*
	(0.006)	(0.006)	(0.122)	(0.099)
Sample proportion/mean	0.411	0.208	3.684	5.380
Unemployed men	0.007	-0.012	0.737***	0.447
	(0.015)	(0.011)	(0.216)	(0.382)
Observations	25,094	25,094	24,151	24,120
DDD estimates[a]	0.010	-0.014	0.750**	0.376
	(0.020)	(0.016)	(0.316)	(0.333)
Sample: Women				
Sample proportion/mean	0.511	0.136	2.673	4.206
Employed women	-0.001	0.003	0.065	-0.102
	(0.005)	(0.002)	(0.069)	(0.066)
Observations	346,835	346,835	333,001	332,588
DDD estimates[a]	0.002	0.001	0.079	-0.173*
	(0.006)	(0.006)	(0.123)	(0.104)
Sample proportion/mean	0.379	0.225	4.457	6.813
Unemployed women	0.029*	-0.010	-0.211	-0.142
	(0.016)	(0.011)	(0.226)	(0.262)
Observations	29,855	29,855	28,494	28,518
DDD estimates[a]	0.032*	-0.012	-0.197	-0.212
	(0.017)	(0.015)	(0.302)	(0.350)

Notes: All models estimated with a LPM (binary outcome) or OLS (continuous outcome) and control for state characteristics, individual characteristics, month fixed effects, state fixed effects, year fixed effects, and state-specific linear time trends. BRFSS sample weights applied. All monetary values converted to 2014 dollars using the CPI – Urban Consumers. Standard errors are clustered around the state and reported in parentheses. ***;**;*=statistically different from zero at the 1%; 5%; and 10% level.

[a] DDD estimates are calculated by taking the difference between the DD estimate and male placebo sample DD estimate (see Table 5 for placebo sample coefficient estimates). 95% confidence intervals for the DDD estimate are calculated using a parametric bootstrap (500 repetitions) and reported in square brackets.

Appendix Table A. Effect of minimum wage increases on mechanisms: BRFSS 1993 to 2014

Outcome:	**Smoke**	**Binge drinker**	**Heavy drinker**	**Any exercise**	**Fruit and vegetables**
Sample: All men					
Sample proportion/mean	0.361	0.306	0.089	0.696	3.146
Lagged minimum wage	0.002	-0.010	0.0004	0.003	-0.069**
	(0.003)	(0.008)	(0.004)	(0.003)	(0.031)
Observations	344,357	309,141	300,605	298,486	182,719
Sample: Employed men					
Sample proportion/mean	0.350	0.304	0.087	0.696	3.150
Lagged minimum wage	-0.0002	-0.009	0.002	0.003	-0.082***
	(0.003)	(0.008)	(0.004)	(0.004)	(0.029)
Observations	319,443	286,000	278,008	276,114	169,554
Sample: Unemployed men					
Sample proportion/mean	0.491	0.324	0.112	0.697	3.097
Lagged minimum wage	0.016	-0.015	-0.016	0.002	0.090
	(0.018)	(0.015)	(0.013)	(0.012)	(0.083)
Observations	24,914	23,141	22,597	22,372	13,165
Sample: All women					
Sample proportion/mean	0.321	0.127	0.041	0.648	3.471
Lagged minimum wage	-0.009**	-0.012*	0.001	0.003	-0.072
	(0.004)	(0.006)	(0.004)	(0.003)	(0.065)
Observations	374,999	336,099	328,651	327,262	201,672
Sample: Employed women					
Sample proportion/mean	0.314	0.125	0.040	0.649	3.477
Lagged minimum wage	-0.007*	-0.012	0.001	0.004*	-0.070
	(0.004)	(0.008)	(0.004)	(0.002)	(0.068)
Observations	345,296	308,879	301,922	300,720	185,798
Sample: Unemployed women					
Sample proportion/mean	0.400	0.141	0.049	0.633	3.402
Lagged minimum wage	-0.029**	-0.012	0.002	-0.004	-0.108
	(0.012)	(0.014)	(0.009)	(0.008)	(0.085)
Observations	29,703	27,220	26,729	26,542	15,874

Notes: All models estimated with a LPM (binary outcome) or OLS (continuous outcome) and control for state characteristics, individual characteristics, month fixed effects, state fixed effects, year fixed effects, and state-specific linear time trends. All monetary values converted to 2014 dollars using the CPI – Urban Consumers. BRFSS sample weights applied. Standard errors are clustered around the state and reported in parentheses. ***;**;*=statistically different from zero at the 1%; 5%; and 10% level.

Appendix Table B. Effect of minimum wage increases on health using alternative controls for between state differences: BRFSS 1993 to 2014

Outcome:	**Very good/excellent**	**Fair/ poor**	**Bad physical health days**	**Bad mental health days**
Sample: Men				
Sample proportion/mean	0.496	0.139	2.134	2.923
Model (1)	-0.001	0.007***	0.028	-0.061
	(0.004)	(0.002)	(0.038)	(0.050)
Model (2)	-0.004	0.010***	0.092**	0.006
	(0.004)	(0.003)	(0.042)	(0.064)
Model (3)	-0.001	0.006***	0.031	-0.067
	(0.004)	(0.002)	(0.038)	(0.051)
Model (4)	0.004	0.005	0.131***	0.033
	(0.004)	(0.004)	(0.049)	(0.065)
Observations	346,536	346,536	333,888	333,380
Sample: Women				
Sample proportion/mean	0.499	0.143	2.827	4.431
Model (1)	0.002	0.002	0.045	-0.091
	(0.006)	(0.002)	(0.062)	(0.069)
Model (2)	-0.002	0.005**	0.043	-0.099
	(0.005)	(0.002)	(0.061)	(0.094)
Model (3)	0.002	0.001	0.015	-0.160**
	(0.005)	(0.002)	(0.057)	(0.072)
Model (4)	0.006	0.001	0.013	-0.029
	(0.003)	(0.002)	(0.036)	(0.059)
Observations	376,690	376,690	361,495	361,106

Notes: All models estimated with a LPM (binary outcome) or OLS (continuous outcome) and control for state characteristics, individual characteristics and month fixed effects. All monetary values converted to 2014 dollars using the CPI – Urban Consumers. BRFSS sample weights applied. Standard errors are clustered around the state and reported in parentheses.
Model (1): controls for state fixed effects, year fixed effects, and state-specific linear time trends.
Model (2): controls for state fixed effects and year fixed effects.
Model (3): controls for state fixed effects, year fixed effects, and state-specific quadratic time trends.
Model (4): controls for state fixed effects, year fixed effects, and region-by-time fixed effects.
***;**;*=statistically different from zero at the 1%; 5%; and 10% level.

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